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# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/848,773 | 05/03/2001 | Qian Chen | 06666/076001/USC-2892 | 6630 |

| | | | EXAMINER |
|---|---|---|---|
| 20985 | 7590 | 05/27/2004 | NGUYEN, KIMBINH T |

FISH & RICHARDSON, PC
12390 EL CAMINO REAL
SAN DIEGO, CA 92130-2081

| ART UNIT | PAPER NUMBER |
|---|---|
| 2671 | |

DATE MAILED: 05/27/2004    11

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. 09/848,773 | Applicant(s) CHEN ET AL. |
|---|---|---|
| | Examiner Kimbinh T. Nguyen | Art Unit 2671 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1)☒ Responsive to communication(s) filed on <u>24 March 2004</u>.

2a)☐ This action is **FINAL**.          2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

4)☒ Claim(s) *1-24,29-39 and 43-63* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24,29-39 and 43-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

## Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

# DETAILED ACTION

1.    This action is responsive to amendment filed 3/24/03.

2.    Claims 1-24, 29-39, 43-63 are pending in the application.

## *Claim Rejections - 35 USC § 103*

3.    The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4.    Claims 1-13, 16, 24, 29, 31-33, 39 and 43-63 are rejected under 35 U.S.C.

103(a) as being unpatentable Zhang et al. (6,608,923) in view of Ayache et al.

(6,175,648).

Claim 1, Zhang et al. (6,608,923) discloses obtaining two images of similar image

information (212, 214 of fig. 2; fig. 3, #314) from two uncalibrated sources (col. 6, lines

58-60); superimposing lines (pairs of corresponding epipolar lines) to rectify the two

images (col. 7, lines 48-66; fig. 5); using the rectified images to form 3D (col. 2, lines 25-

37) by forming a disparity map of 3D. Zhang et al. does not teach forming of 3D by

using a disparity map; however Ayache et al. teaches using the rectified images to form

3D by forming a disparity map of 3D (col. 4, line 9 through col. 7, line 29). It would have

been obvious to one of ordinary skill in the art at the time the invention was made to

incorporate the disparity map as taught by Ayache into the method for rectifying images

of Zhang for forming 3D image from 2D similar images, because it would provide a

process for producing cartographic data in 3D from 2D images of the scene (col. 2, lines

35-37).

**Claims 2-4, 9-13,16, 24**, Ayache et al. teaches disparity map indicating an

estimate of 3D surface and information of the estimate (col. 2, lines 40-44; col. 4, lines

12-17); manually establishing matching parts (col. 4, lines 32-34, lines 47-49);

identifying parts in the image (col. 8, lines 40-44), using automatically rectified images to

form 3D information (col. 5, lines 3-14); forming a disparity surface indicative of 3D

information of the image (col. 8, lines 65-67); a difference between coordinates of

matching pixels (col. 9, lines 8-10); a variable denoting a degree of similarity between

pixels (col. 8, lines 55-58), a variable of error in 3D surface (a degree of disparity which

is inconsistent with the disparities on all the other curves; col. 9, lines 6-7). It would have

been obvious to one of ordinary skill in the art at the time the invention was made to

incorporate the disparity map, estimating, matching as taught by Ayache for forming 3D

image from 2D similar images, because it would provide a process for producing

cartographic data in 3D from 2D images of the scene (col. 2, lines 35-37).

**Claims 5-7**, Zhang (6,608,923) discloses defining images in terms of epipolar

geometry (col. 5, lines 29-32; col. 6, lines 44-49), aligning the images in the epipolar

geometry (col. 14, lines 51-62); aligning specified reference lines which include lines

passing through manually-obtained image parts (col. 12, lines 34-53).

**Claim 8**, Zhang (6,608,923) discloses finding an average of end points of two different reference lines (a pair of epipolar lines), forming a line through an averaged part (col. 6, lines 30-43; figs. 4 and 5).

**Claims 29, 31, 32, 33**, Zhang (6,608,923) discloses obtaining first and second images of the same object (fig. 2; #210, #212, #214); identifying objects in the first and second images, forming lines which intersect the objects; aligning the lines in an epipolar geometry (figs. 4 and 5); using the first and second images with the aligned lines to form 3D information (figs. 8-11); identifying seed voxel (3D corresponding pixel information u,v that is unique) for different parts of 3D surface with a high probability of being correct 3D which is greater than a specified threshold (0.99 or equals to one); (col. 6, lines 2-9). Zhang does not teach identifying a seed voxel; however, Zhang teaches 3D object, in the image, points and lines are represented by 3D column vectors, where the points are uniquely identified by u, v and w (col. 5, line 59 through col. 6, line 9), and could be a voxel when pixel is identified in the 3D space data or volume data. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a seed voxel, because rectification of each image is produced with minimum distortion (col. 2, lines 36-37).

**Claim 39**, the rationale provided in the rejection of claims 9 and 29 is incorporated herein.

**Claims 43 and 44**, Zhang (6,608,923) teaches an image from two uncalibrated cameras to obtain 3D information (col. 6, lines 18-22, lines 59-60); rectifying the image (col. 2, lines 36-37) to form coplanar images with scan lines are horizontally parallel;

identifying points, scan lines which pass through the points forming horizontally parallel

scan lines (col. 1, lines 38-50). **Claim 45**, Zhang does not teach disparity map; however,

Ayache teaches disparity map (col. 7, lines18-30). It would have been obvious to one of

ordinary skill in the art at the time the invention was made to incorporate the disparity

map as taught by Ayache into the method for rectifying images of Zhang for forming 3D

image from 2D similar images, because it would provide a process for producing 3D

image from 2D image of a scene (col. 1, lines 5-7).

**Claims 46-63**, the rationale provided in the rejection of claims 1, 3, 5-8, 29, 43, 44

above is incorporated herein.

5.      Claims 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable Zhang

et al. (6,608,923) in view of Ayache et al. (6,175,648) and further in view of Sawhney

et al. (6,571,024).

**Claims 19-23**, Zhang does not teach Euclidean points; however, Sawhney et al.

teaches converting the volume to Euclidean points (col. 5, lines 53-55); projecting a

reconstruction of the volume, reconstructing Euclidean points from the projective

reconstruction (col. 6, lines 25-36); transforming an origin of coordinate system to an

origin of the images (image transformation; fig. 18, # 804); input a parameter (focal

length; adjust the parameter (refining parameter; fig. 18, # 806) to approximate a proper

Euclidean reconstruction (col. 5, lines 37-61). It would have been obvious to one of

ordinary skill in the art at the time the invention was made to incorporate the Euclidean

reconstructing as taught by Sawhney into the method for rectifying images of Zhang for

forming 3D image from 2D similar images, because it would provide a method of

camera pose and scene geometric information for each frame of a video sequence (col. 2, lines 2-3).

6.    Claims 14-16, 24, 30, 34-38 are rejected under 35 U.S.C. 103(a) as being unpatentable Zhang et al. (6,608,923) in view of Ayache et al. (6,175,648), and further in view of VanEssen et al. (6,591,004).

**Claims 14, 15,** Zhang does not teach tracing voxels; however, VanEssen et al. teaches tracing voxels in a multiresolution at coarsest level and a more detailed level (col. 25, lines 42-45; col. 26, lines 55-67); selecting the seed voxel using a winner take which has a maximum correlation value; identifying seed voxels which represent incorrect matches, removing the seeds after tracing (col. 19, lines 53-67). **Claim 16, 24,** Zhang does not teach a seed voxel; however, VanEssen et al. teaches selecting a seed voxel by finding uniqueness (col. 44, line 65 through col. 45, line 23); dividing the surface into parts (segmented), the seed voxels are respectively for parts (col. 22, lines 28-36). **Claim 30, 34-38,** VanEssen et al. teaches forming the surface map by propagating from the seed voxel; determining intersection between two voxels at different parts; determining probability of two voxels finding neighbors for voxels one by one);(col. 25, lines 49-55), and selecting the higher probability as the voxel to use selecting a seed voxel that the best matches the corresponding pixel information and has a probability of being correct which is greater than a specified threshold (col. 26, line 64 through col. 27, line 5); identifying voxels represent incorrect matches and removing incorrect matching voxels (col. 23, lines 27-40). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the

tracing voxels and selecting voxels as taught by VanEssen into the method for rectifying images of Zhang for forming 3D image from 2D similar images, because it would provide a method for reconstructing surfaces and analyzing surface volume representations of the shape of an object corresponding to image data, in which the object has been modeled as one or more physically distinct compartments (col. 2, lines 53-57).

7.    Claims 17, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable Zhang et al. (6,608,923) in view of Ayache et al. (6,175,648), and further in view of VanEssen et al. (6,591,004) and Szeliski et al. (5,917,937).

**Claims 17 and 18**, Zhang does not teach using a winner take which has a maximum correlation value; however, Szeliski et al. teaches winning cell (col. 9, lines 40-45). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the seed voxel and winning cell as taught by Szeliski into the rectifying images of Zhang's method for forming 3D images, because it would provide a stereo matching method simultaneously recovers disparities from input images to reconstruct 3D surface (abstract).

8.    Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Kimbinh Nguyen** whose telephone number is **(703) 305-9683**. The examiner can normally be reached **(Monday- Thursday from 7:00 AM to 4:30 PM and alternate Fridays from 7:00 AM to 3:30 PM)**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

**Or faxed to:**

**(703) 872-9314 (for Technology Center 2600 only)**

Hand-delivered responses should be brought to Crystal Part II, 2121 Crystal Drive,
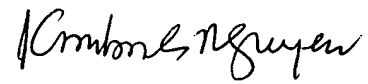
Arlington, VA, Sixth Floor (Receptionist).


Any inquiry of a general nature or relating to the status of this application or

proceeding should be directed to the Technology Center 2600 Customer Service Office

whose telephone number is (703) 306-0377.


Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

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you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

May 19, 2004

Kimbinh Nguyen

Patent Examiner AU 2671